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(71) Applicant(s)
Xerox Corporation

(Incorporated in USA - New York)

Xerox Square, Rochester, New York 14644,
United States of America

(72) Inventor(s)
Jamieson Crawford

(74) Agent and/or Address for Service
Margaret D Phillips
Rank Xerox Limited, Patent Department, Parkway,
MARLOW, Buckinghamshire, SL7 1YL,
United Kingdom

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(56) Documents Cited
WO 92/21082 A1   WO 91/07826 A1   US 5111004 A

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(54) A computer mouse

(57) A mouse 10 for operating a computer 25 includes operating keys 12, and means 11 for verifying or
recognising biometric features, such as fingerprints, palm prints, other characteristics of the hands or fingers,
or voice , of one or more users to permit or deny access to the computer. The mouse may be linked to the
computer by a cable 13 or by infrared transmission means. All the fingerprint verification or recongnition
circuitry is contained in the mouse, and initially a fingerprint is sensed by a sensor 24 and stored in memory 21
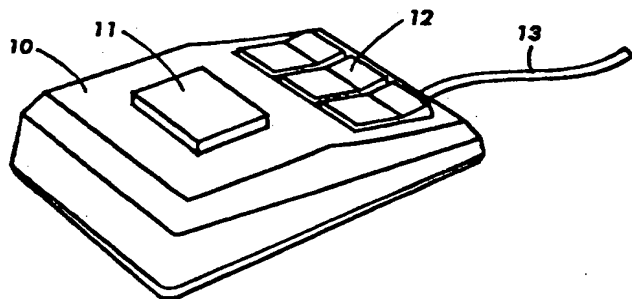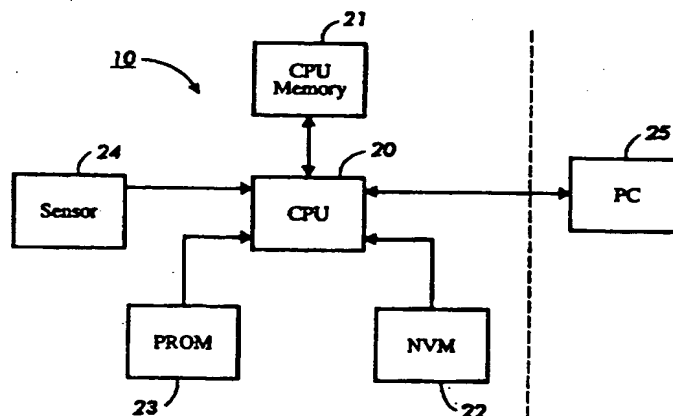to identify, on future occasions, an authorised user.
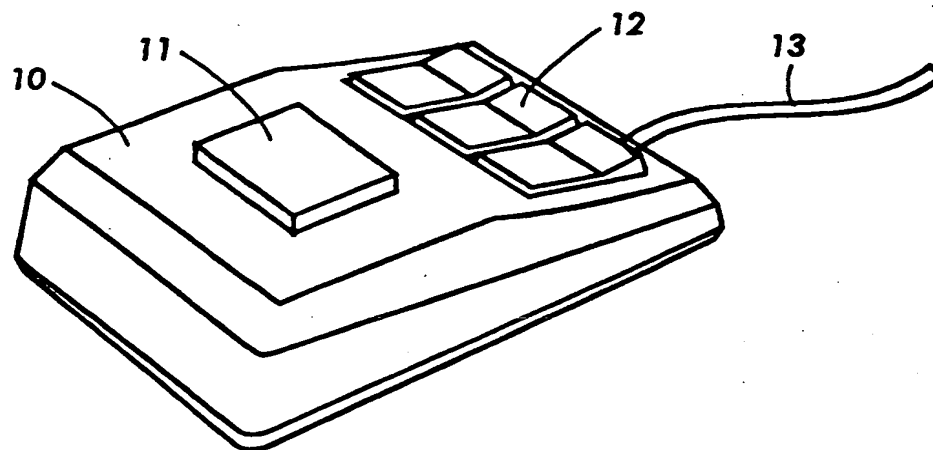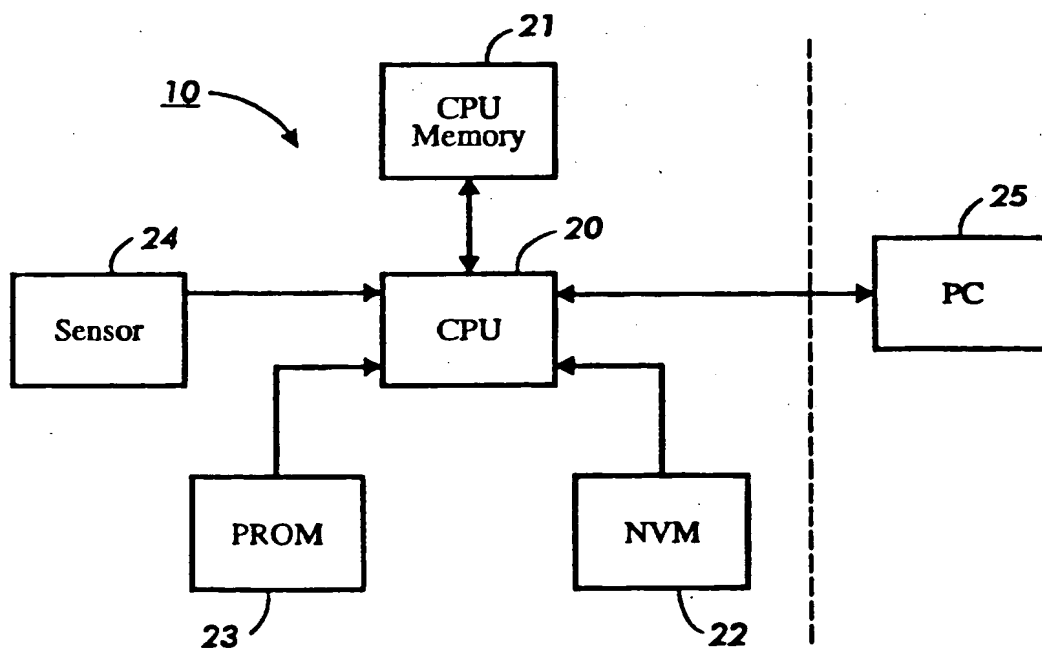
FIG. 1

FIG. 2

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FIG. 1

FIG. 2

MOUSE FOR A COMPUTER

This invention relates to a mouse for operating a computer.

The use of a mouse, in addition to a keyboard, has become well established for personal computers. By moving a mouse over a surface, such as the surface of a table or desktop, or of a special pad, the user is able to move a representation of a pointer over a computer screen, and can select an operation (described or represented by an icon on the screen) by using one or more buttons carried by the mouse.

One of the main problems with computers, whether stand-alone or connected to a network, is that of security. To prevent unwanted users from gaining access to a given computer or network, a system of passwords is usually employed. With such a system, each time a user starts up his computer, or logs onto a network, he enters a password. Even this system has disadvantages. The user must remember his password, and then enter it each time he logs on. Also, users are often required to change their passwords at regular intervals. Additional security may be provided by making it necessary to re-enter the password every time the computer has been left unused for a predetermined period of time, so that if an authorised user is called away from his computer he does not have to log out or switch it off. This approach, however, makes it inconvenient for the authorised user. Furthermore, passwords are not always completely secure; they can be discovered by chance, or as a result of negligence by the authorised user, or by trial and error.

It is an object of the present invention to provide a mouse for a computer which overcomes these disadvantages.

According to the present invention, there is provided a mouse for operating a computer, the mouse including means for verifying or recognising biometric features of one or more users to permit or deny access to the computer.

The means for verifying or recognising biometric features may include a sensor, recognition circuitry responsive to the sensor for providing electrical codes representing one or more biometric features of a user, a memory for storing codes representing said biometric features of one or more authorised users, and verification or recognition circuitry for comparing said electrical codes with said codes stored in memory.

The means for verifying or recognising biometric features preferably comprises fingerprint recognition means.

The mouse of the invention has the advantage that it makes the computer, or the computer network, much more secure than using a password, while at the same time completely removing one level of interface between the user and the computer. In other words, when an authorised user wants to log on to his computer, it is only necessary to touch the mouse (in the recognition mode) or enter his user name and touch the mouse (in the verification mode) and the computer is ready for use. This is also a valuable time saver if the computer uses the 'time-out' feature, whereby, rather than re-entering his password after a time-out, he only needs to touch the mouse. The use of

fingerprints for verification of an authorised user has, of course, the added advantage that fingerprints, so far as is known, are unique to a given person, do not need to be remembered, and cannot be discovered like a password can.

A mouse for a computer in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view of the mouse; and

Fig. 2 is a schematic of the circuits used in the mouse.

Referring to Fig. 1, the mouse 10 of the invention is of the same general configuration and size as any standard mouse, but is modified by the inclusion of a fingerprint verification or recognition device, which may have a sensor comprising a small platen 11. In standard fashion, the mouse has function keys 12, and a cable 13 to connect it to a computer. Alternatively, the mouse may be linked to the computer by infra-red transmission means. The mouse may operate by any of the known systems, such as a rolling ball as a movement sensor, or a light and photosensor system using a dedicated mat or pad having a regular pattern of markings.

Although the use of a fingerprint verification or recognition device is described herein, any suitable biometric verification or recognition system may be used, i.e. systems which measure characteristics of the user such as palm prints; sizes, shapes, temperatures, pressures, colours or smells of hands or fingers; or voice.

Examples of fingerprint recognition systems are described in EP-A-0,640,933, EP-A-0,459,712, EP-A-0,348,182, EP-A-0,071,269 and US-A-5,373,181. Various sensing arrangements are described in these patents, including optical, electrical and pressure sensing devices. They all have in common the fact that they produce a set of electrical signals, or code, representing selected characteristics of the fingerprint. In some of these systems, the amount of information required to characterise a fingerprint can be very large. One way of reducing the amount of information needed to characterise a complete fingerprint is described in the article "Little Waves, Big Squeeze", published in the New Scientist, 2 March, 1996. For verification purposes, however, it may not be necessary to characterise the complete fingerprint, but to use only selected features. In order to 'read' the fingerprint consistently, it may be desirable to locate the platen or other sensing area within a cavity of appropriate shape to take the end of a finger, to allow a more accurate placement of the finger.

Referring now to Fig. 2, the mouse contains the necessary circuits to enable it to function as an accessory to a wide range of computers. To this end, it contains all the fingerprint verification or recognition circuitry (rather than relying on the computer for this function). A typical arrangement includes a CPU 20, with its own working memory 21, a programmable read only memory (PROM) 23 such as an EEPROM, for storing the fingerprint recognition software, and a non-volatile memory (NVM) 22, for storing the electrical codes representing the fingerprints of authorised users. Input is provided by an appropriate sensor 24, which may be, for example, an optical, electrical or pressure

sensitive sensor. The mouse is connected by cable 13 to a computer 25 such as a personal computer.

In operation, the mouse has two modes; a learn mode, in which a fingerprint is initially recognised and stored to identify, on future occasions, an authorised user, and a normal mode, either for verification or for recognition of the user, in which the mouse will only give computer access to an authorised user.

In an example of the learn mode, the process is as follows:

1)   The learn mode is established, for example by inserting a disc containing the initialisation routine software, to enable the mouse to communicate with the computer. In a network system, it might also be made necessary to open up the process by means of a systems administrator.

2)   The computer prompts the user for a user name.

3)   The user enters the user name into the computer.

4)   The computer prompts the user to place the selected finger onto the fingerprint sensor on the mouse.

5)   The sensor scans the fingerprint and generates the fingerprint code.

6)   The fingerprint code is stored in the NVM against the user name.

7)   A unique 'go-code' is generated for each fingerprint (or for the individual mouse).

8)   The go-code is stored in both NVM and the computer.

In an example of the normal mode, for verification of the user, the process is as follows:

1)   The computer prompts the user for a user name.

2)   The user enters the user name into the computer.

3)   The computer prompts the user to place the selected finger onto the fingerprint sensor on the mouse.

4)   The sensor scans the fingerprint and generates the fingerprint code.

5)   The fingerprint code is stored temporarily in CPU memory.

6)   The CPU compares this fingerprint code with the fingerprint of the authorised user stored in the NVM.

7)   If there is a match, the mouse transmits the go-code to the computer, and the computer allows the user access to the system.

8)   . If there is no match, the mouse transmits a stop-code to the computer, which denies the user access to the system.

In an example of the normal mode, for recognition of the user, the process is as follows:

1)   The computer prompts the user to place the selected finger onto the fingerprint sensor on the mouse.

2)   The sensor scans the fingerprint and generates the fingerprint code.

3)   The fingerprint code is stored temporarily in CPU memory.

4)   The CPU compares this fingerprint code with the fingerprints of the authorised users stored in the NVM.

5)   If there is a match, the mouse transmits the go-code to the computer, and the computer allows the user access to the system.

6)   If there is no match, the mouse transmits a stop-code to the computer, which denies the user access to the system.

The mouse can be supplied substantially ready for use, along with the relevant initialisation software, which might conveniently be supplied on a floppy disc. Once an authorised user has set up the mouse as described above, no-one else can use the computer unless authorised in the same way as the first authorised user, the authorisation of second and subsequent users being controlled such that for example, only the first authorised user can admit subsequent authorised users, or substitute alternative users.

It is known to use fingerprint recognition to allow access to a computer, as described for example in EP-A-0,348,182, column 7, lines 49 - 59, where a fingerprint recognition system is built in to a keyboard. The mouse of the present invention offers considerable benefits, however, in that it can be used with existing computers or systems without modification, and without the need to add any other components other than replacing the mouse, which is the least expensive part of a computer set-up.

Claims:

1.   Mouse for operating a computer, the mouse including means for verifying or recognising biometric features of one or more users to permit or deny access to the computer.

2.   The mouse of claim 1 wherein said means for verifying or recognising biometric features comprises fingerprint recognition means.

3.   The mouse of claim 1 or claim 2 wherein said means for verifying or recognising biometric features includes a sensor, recognition circuitry responsive to the sensor for providing electrical codes representing one or more biometric features of a user, a memory for storing codes representing said biometric features of one or more authorised users, and verification or recognition circuitry for comparing said electrical codes with said codes stored in memory.

4.   The mouse of claim 3 including means for entering into the memory, during an initialisation operation, said codes of authorised users, and means for preventing changes to said stored codes other than by authorised users.

5.   The mouse of claim 4 wherein, during the initialisation operation, the mouse generates a mouse recognition code, and instructs the computer to operate only in response to that mouse code, the mouse code being generated either randomly during initialisation, or being a unique code pre-programmed into the mouse, or being generated from predetermined parameters of the electrical codes representing the biometric feature.

6.   The mouse of any one of claims 1 to 5 wherein said memory is a non-volatile memory, and wherein the code of an authorised user can be changed only in response to successful verification or recognition of the biometric feature, or in response to the entry of a password.

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Claims searched: 1-6	**Date of search:** 12 June 1996

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

   UK Cl (Ed.O): F2Y YSP YSX YTA   G4A AAP

   Int Cl (Ed.6): A61B 5/117 G06F 1/00 G06K 9/00 11/18 11/20

Other: Online:WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	WO 92/21082 A1 (Eden Group Limited) see e.g. page 4 lines 7-18 and page 6 line 14	1, 2
Y	WO 91/07826 A1 (Russell) see page 16 line 20 - page 18 line 28	1, 2, 3
Y	US 5111004 (Gullman) see column 1 lines 9-12	1, 2, 3